FRANKLIN

National Facility
Oceanographic Research Vessel

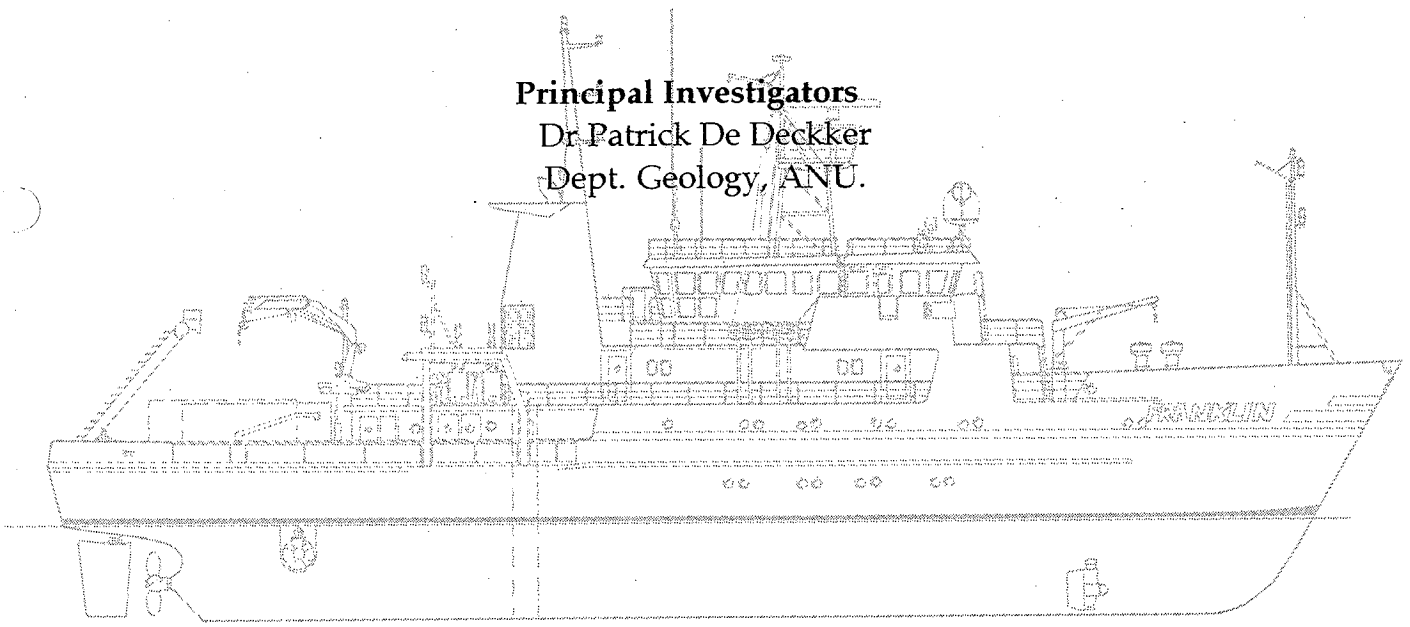
RESEARCH PLAN

FR 2/96

Sail	Fremantle	1000	Thursday 21 February 1996
Arrive	Dampier	1000	Wednesday 6 March 1996

The climatic evolution of the eastern Indian Ocean in the vicinity of Australia.

Principal Investigators
Dr Patrick De Deckker
Dept. Geology, ANU.



November 1995

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AUSTRALIA

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FRANKLIN

Research Plan
Cruise Fr2/96

Itinerary

Sail	Fremantle	1000	Thursday 21 February 1996
Arrive	Dampier	1000	Wednesday 6 March 1996

PROJECT TITLE

The climatic evolution of the eastern Indian Ocean in the vicinity of Australia, and the modern distribution and chemistries of planktic and benthic organisms for the interpretation of deep-sea cores

PRINCIPAL INVESTIGATOR

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OBJECTIVES

The primary goal of the proposed research project is to obtain information from the modern realm which can be applied to the fossil record in order to better assess the climatic history of the Australian region and global palaeoenvironmental changes. The interpretation of palaeoclimatic changes throughout the Cenozoic is based largely on microfossils, such as foraminifera, and the chemistries of their tests. The proposed research cruise involves a multidisciplinary approach, using relatively new, innovative techniques to obtain valuable information from benthic and planktic foraminifera, ostracods, pteropods, nannoplankton, diatoms, and radiolarians which will be used to study ancient climate. The results of this research will be useful on a global scale and will make a significant contribution to our understanding of the ecology and palaeoecology of marine micro-organisms and their use as indicators of changes in palaeoenvironmental conditions. The following specific objectives will collectively achieve this goal.

1) Determine the ecology and palaeoecology of planktic foraminifera, radiolarians and calcareous nannoplankton, as well as benthic foraminifera and ostracoda species found in the eastern Indian Ocean, specifically focussing on microhabitat preferences, adaptive morphologies and epifaunal/infaunal ratios. Information about the ecology of these organisms is essential for accurate assessment of fossil assemblages. This is especially relevant for Quaternary and Holocene fossil assemblages, as most of the species found in these assemblages are also found in modern oceans.

2) Measure trace-element chemistries of planktic foraminifera as well as benthic foraminifera and ostracoda, which have been used as indicators of important oceanic conditions, including productivity.

3) Establish the relationship between the distributions of benthic organisms and environmental parameters such as sediment type, amount of organic carbon in the sediments and bottom-water oxygen levels. Currently no detailed modern ecological information is available for many meiofaunal taxa, including benthic foraminifera, in Australian waters because the vast majority of recent ecological research has focused on populations from the Northern Hemisphere.

4) Interpret the late-glacial and Holocene climatic history of the eastern Indian Ocean near Australia. It will be possible to apply the information obtained from modern assemblages to fossil assemblages from core material taken in the eastern Indian Ocean to assess palaeoceanographic changes in surface- and bottom-water conditions, productivity, and the related effects of these changes on the global CO_2 budget and climate. Sediment cores from the same areas where the modern data is collected would be used to assess ancient climatic conditions over the last 25,000 years in the Australian region. In particular, our laboratory is focussing on the mid-Holocene warm phase which is recognised in the oceans worldwide, and which may represent an analogue for the predicted warming to occur under the future "greenhouse effect".

SAMPLING

Gravity cores:

We anticipate collecting some 47 gravity cores from a variety of areas offshore Western Australia, with particular emphasis on the coastal zone (although in deep water) between Perth and Geraldton, and then from the Cuvier and Wallaby Plateaux, the northern end of the Exmouth Plateau, the Roo and Sunda Rises (south of the Indonesian EEZ), and the Wombat Plateau. The proposed cruise track is presented in the enclosed map and table. The top of each gravity cores will be sampled for the collection of infaunal organisms.

CTD profiles:

A total of 27 CTD profiles has been selected in order to determine characteristics of the watermasses in the vicinity of the coring sites so as to better interpret the palaeoenvironmental data to be obtained from the cores. We would want to obtain dissolved oxygen and nutrient data for the majority of the CTD profiles. In addition, we wish to collect water samples through the use of Niskin bottles for trace-element, stable isotopes and total carbon analyses in the laboratory at ANU.

Plankton samples:

During the entire voyage, we anticipate collecting approximately 25 plankton tows (using a net with a close-up system) from the upper 100m of the water column in order to determine t' distribution of plankton within the upper parts of the water column. The CTD profiler is to be used at the same sites of plankton collection in order to determine the salinity, temperature and dissolved oxygen characteristics of the water column from which plankton collections are to be made.
Water samples are to be taken using Niskin bottles from the CTD profiler to filter out calcareous nannoplankton and siliceous mocro-organisms from the same profiles.

ORV FACILITIES REQUIRED

For the CTD profiles:

12 bottle rosettes with 10L bottles and use of reversing thermometer. We are requesting for ORV staff to measure oxygen, salinity, NO_3+NO_2, SiO_2 and PO_4. We would take samples for trace elements, total carbon and stable isotopes. A total of 27 CTD profiles is planned. As mentioned before, we would want to filter 10L from the other CTD profiles to be taken in conjunction with the 25 plankton collections from the upper 100m of the water column.

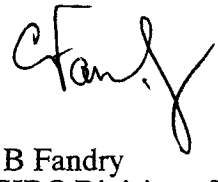
Containered deck laboratory:

access to this laboratory is required for processing plankton samples, filtering waters for nannoplankton and chemical analyses, and processing some of the core-top material.

PARTICIPANTS

Dr Patrick De Deckker,	Chief Scientist,	ANU
Dr Ignacio Martinez,	Co- Chief Scientist,	ANU
Ms Margaret Chorley,		ANU
Dr Christian Hass,		University College London & GEOMAR, Kiel, Germany
Mr David Ryan,		ANU
Mr Kyoma Takahashi,		Hokkaido University
Mr Yusuke Yokoyama,		ANU
Mr Jeff Dunn,	Cruise Manager,	CSIRO ORV
Mr Ron Plaschke		CSIRO ORV
Mr Erik Madsen		CSIRO ORV

This cruise plan is in accordance with the directions of the National Facility Steering committee for the oceanographic research vessel *Franklin*.



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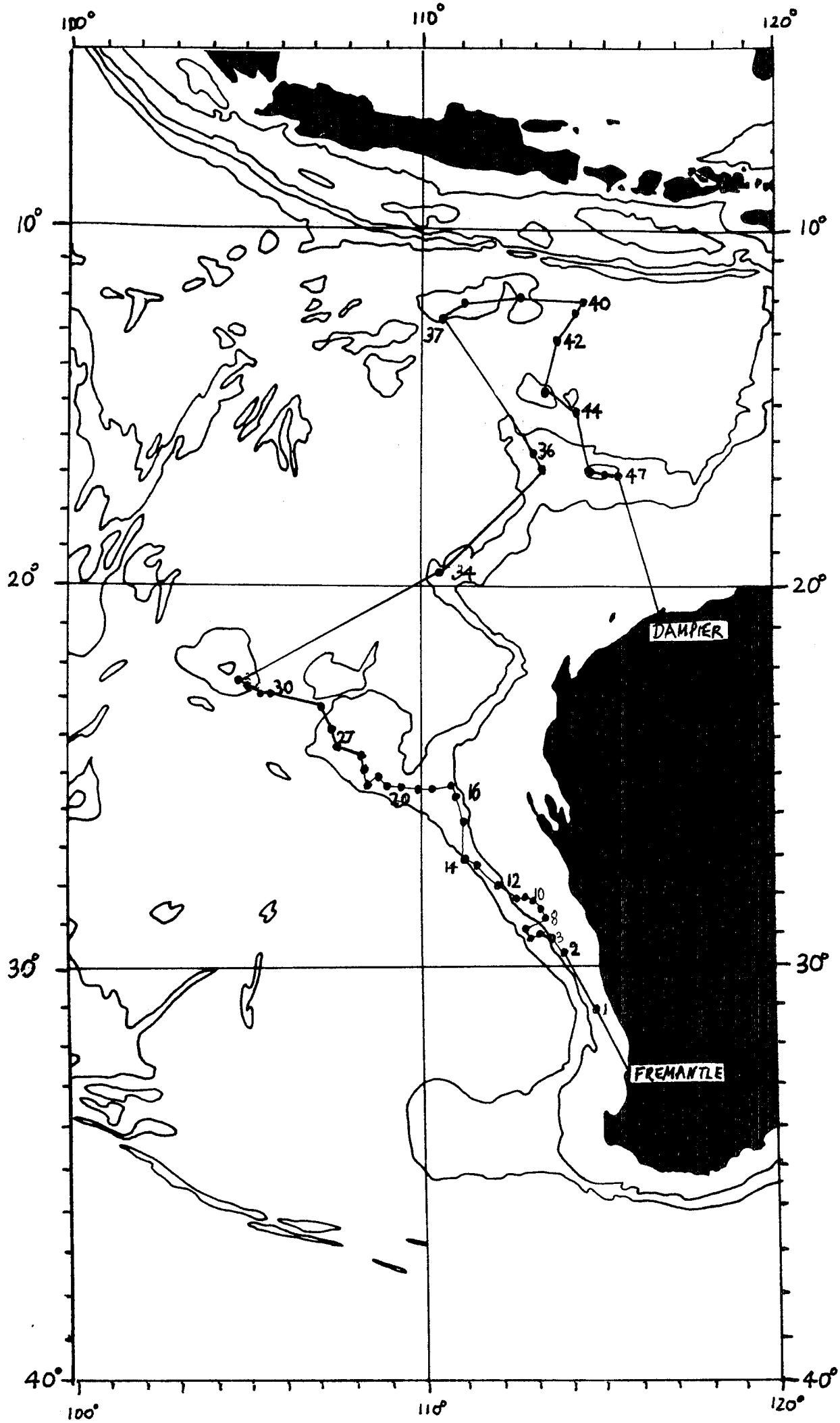
National Facility Steering Committee

November 1995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